THE JOURNAL OF AGRICULTURAL SCIENCE

EDITED BY

R. B. AUSTIN, D.SC., Plant Breeding Institute, Cambridge

B. W. BACHE, M.A., PH.D., C.CHEM., F.R.S.C., Department of Applied Biology, Cambridge

PROF. SIR J. W. L. BEAMENT, SC.D., F.R.S., Department of Applied Biology, Cambridge

G. D. H. BELL, C.B.E., PH.D., SC.D.(*h.c.*), D.SC.(*h.c.*), F.R.S., 6 Worts Causeway, Cambridge

SIR K. L. BLAXTER, PH.D., N.D.A. (HONS.), D.SC., F.R.S.E., F.R.S., Stradbroke Hall, Stradbroke, Suffolk

PROF. A. D. CARE, D.SC., M.R.C.V.S., Department of Animal Physiology and Nutrition, Leeds

J. A. CURRIE, PH.D., 6 Falconers Field, Harpenden

S. K. ELTRINGHAM, PH.D., Department of Applied Biology, Cambridge

PROF. J. L. JINKS, C.B.E., D.SC., F.I.BIOL., F.R.S., Agricultural and Food Research Council, 160 Great Portland Street, London W1N 6DT

D. B. LINDSAY, B.SC., M.A., D. PHIL., CSIRO Division of Tropical Animal Science, Tropical Cattle Research Centre, Rockhampton, Queensland, Australia

PROF. J. B. OWEN, B.SC., PH.D., M.A., Department of Agriculture, Bangor

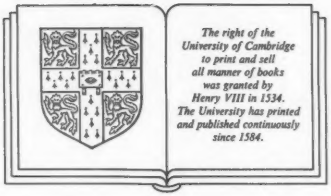
W. J. RIDGMAN, M.A., Department of Applied Biology, Cambridge

PROF. E. W. RUSSELL, C.M.G., D.SC., F.INST.P., Department of Soil Science, University of Reading

F. YATES, C.B.E., SC.D., F.R.S., Rothamsted Experimental Station, Harpenden

VOLUME 106

CAMBRIDGE UNIVERSITY PRESS
CAMBRIDGE
LONDON NEW YORK NEW ROCHELLE
MELBOURNE SYDNEY
1986



PUBLISHED BY

THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE

The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

© Cambridge University Press 1986

Printed in Great Britain by the University Press, Cambridge

Contents

Part 1 (February 1986)

PAGE

Virk, D. S. and Virk, Parminder, S. The assessment of genetic variation from normal, self and backcross families of a triple test cross of pure-breeding lines in wheat . . . 1

Singh, R. K., De, R. and Turkhede, B. B. Time of application of farmyard manure and fertilizer nitrogen on the growth, yield and nutrient uptake of dryland wheat . . 7

El-Hadi, H. M. The effect of dehydration on Sudanese desert sheep and goats . . . 17

Iremiren, G. O. and Okiy, D. A. Effects of sowing date on the growth, yield and quality of okra (*Abelmoschus esculentus* (L.) Moench.) in southern Nigeria 21

Williams, Ingrid H., Martin, A. P. and White, R. P. The pollination requirements of oil-seed rape (*Brassica napus* L.) 27

Weller, R. F. and Phipps, R. H. The feeding value of normal and brown midrib-3 maize silage 31

Grewal, H. S. and Gill, H. S. Influence of NAA and nitrogen on the growth and yield of late-planted paddy (*Oryza sativa* L.) 37

Sharma, B. D. and Katyal, J. C. Evaluation of amounts, methods and sources of zinc application to wheat in flood plain soils 41

Barraclough, P. B. The growth and activity of winter wheat roots in the field: nutrient uptakes of high-yielding crops 45

Barraclough, P. B. The growth and activity of winter wheat roots in the field: nutrient inflows of high-yielding crops 53

Catt, J. A., Gutteridge, R. J. and Slope, D. B. Take-all distribution and soil type on Chalky Boulder Clay 61

Davies, Patricia A. and Armstrong, A. Field measurements of grassland poaching . . 67

Caligari, P. D. S. Powell, W. and Jinks, J. L. The use of doubled haploids for detecting linkage and pleiotropy between quantitatively varying characters in spring barley . 75

Parr, R. A., Williams, A. H., Campbell, I. P., Witcombe, G. F. and Roberts, A. M. Low nutrition of ewes in early pregnancy and the residual effect on the offspring . . 81

Stoddard, F. L. Pollination and fertilization in commercial crops of field beans (*Vicia faba* L.) 89

Quaite, Elsie and Camlin, M. S. The use of electrophoretically labelled populations for intraspecific competition studies in perennial ryegrass (*Lolium perenne* L.) swards . 99

Singh, D. P. and Singh, P. K. Relative effects of *Azolla pinnata* and its combination with chemical nitrogen fertilizer on growth, yield and N uptake of rice 107

Mahalakshmi, V. and Bidinger, F. R. Water deficit during panicle development in pearl millet: yield compensation by tillers 113

Coleman, G. S. The distribution of carboxymethylcellulase between fractions taken from the rumens of sheep containing no protozoa or one of five different protozoal populations . 121

Tallowin, J. R. B., Williams, J. H. H. and Large, R. V. Some consequences of imposing different continuous grazing pressures in the spring on sward morphology, herbage quality and the performance of young beef cattle 129

Kayode, G. O. Further studies on the response of maize to K fertilizer in the tropics . 141

PAGE

VON SURY, F. and NÖSBERGER, J. Effects of season, altitude and daylength on floral initiation of two contrasting genotypes of *Trifolium repens* L. 149

JOHNSTON, A. E., LANE, P. W., MATTINGLY, G. E. G., POULTON, P. R. and HEWITT, M. V. Effects of soil and fertilizer P on yields of potatoes, sugar beet, barley and winter wheat on a sandy clay loam soil at Saxmundham, Suffolk 155

NARWAL, S. S., POONIA, S., SINGH, G. and MALIK, D. S. Response of winter-sown maize cultivars to sowing time and row direction in north-west India 169

GATENBY, RUTH M. Exponential relation between sweat rate and skin temperature in hot climates 175

SUDHAKARA, K. and PRASAD, R. Relative efficiency of prilled urea, urea supergranules (USG) and USG coated with neem cake or DCD for direct-seeded rice 185

SHORT NOTES

MAXWELL, W. M. C. and HEWITT, L. J. A comparison of vaginal, cervical and intrauterine insemination of sheep 191

CHUDE, V. O. Relation between hot-water-soluble boron and uptake of boron by cacao (*Theobroma cacao* L.) in Nigeria 195

GRAY, D. and STECKEL, JOYCE R. A. Comparison of plant-to-plant variability from F_1-hybrid and open-pollinated carrot cultivars 199

MAXWELL, W. M. C. and BARNES, D. R. Induction of oestrus in ewes using a controlled internal drug release device and PMSG 201

RIDGMAN, W. J. and JONES, J. L. Residual effects of potassium fertilizer 205

PART 2 (APRIL 1986)

BOLTON, SARAH C. and WEEKES, T. E. C. The response of plasma minerals, free fatty acids and glucose to adrenaline and cortisol infusion in sheep 209

FAICHNEY, G. J. and GHERARDI, S. G. Relationships between organic-matter digestibility, dry-matter intake and solute mean retention times in sheep given a ground and pelleted diet 219

KEMPSTER, A. J., CHADWICK, J. P. and CHARLES, D. D. Estimation of the carcass composition of different cattle breeds and crosses from fatness measurements and visual assessments 223

KEMPSTER, A. J. Estimation of the carcass composition of different cattle breeds and crosses from conformation assessments adjusted for fatness 239

DE, MAINE, M. J. A method of testing the resistance of potato cultivars to tuber damage caused by squeezing 255

SAVAN, P. M. J., JEACOCK, MARJORIE K. and SHEPHERD, D. A. L. Gluconeogenesis in foetal, suckling and weaned lambs: the effect of glucagon 259

HEAP, R. B., FLEET, I. R., HAMON, M., BOOTH, J. M. and CHAPLIN, V. M. Hormone changes in milk at the onset of lactogenesis and parturition in Friesland sheep . . . 265

BRAITHWAITE, G. D. Phosphorus requirements of ewes in pregnancy and lactation . . 271

RAI, R. Manganese-mediated resistance to aluminium and antibiotics in strains of *Azospirillum brasilense* and their interaction with rice genotypes in acid soil . . . 279

WAGHORN, G. C., REID, C. S. W., ULYATT, M. J. and JOHN, A. Feed comminution, particle composition and distribution between the four compartments of the stomach in sheep fed chaffed lucerne hay at two feeding frequencies and intake levels 287

PAGE

KROLL, O., OWEN, J. B. and WHITAKER, C. J. Variation in the complete diet composition given during the winter period to an autumn-calving herd 297

FITT, B. D. L., FINNEY, M. E. and CREIGHTON, N. F. Effects of irrigation and benomyl treatment on chocolate spot (*Botrytis fabae*) and yield of winter-sown field beans (*Vicia faba*) 307

AKORODA, M. O. Allogamy, varietal adulteration and the breeding of okra (*Abelmoschus esculentus* (L.) Moench.) in Nigeria 313

SINGH, BALWINDER and BAJWA, M. S. Studies on the leaching of urea in sodic soils . . 323

RAO, J. L. N. and RAJARAMAMOHAN RAO, V. Nitrogen fixation (C_2H_2 reduction) as influenced by sulphate in paddy soils 331

FORD, E. J. H. and EVANS, JOAN. The effect of triamcinolone on glucose metabolism in ketotic sheep 337

TULLOH, N. M., BRIMBLECOMBE, HELEN and DENNIS, CAROLYN. The effect of severe nutritional deprivation in early post-natal life on tissue and cellular responses during subsequent growth of lambs to the age of 4 months 341

GEENTY, K. G. and SYKES, A. R. Effect of herbage allowance during pregnancy and lactation on feed intake, milk production, body composition and energy utilization of ewes at pasture 351

SYKES, A. R. and GEENTY, K. G. Calcium and phosphorus balances of lactating ewes at pasture 369

CABRERA, A. and MARTIN, A. Variation in tannin content in *Vicia faba* L. 377

VINCENT, ISOBEL C., WILLIAMS, H. LL., MICHELL, A. R. and HILL, R. The effects of 'adequate' and 'low' sodium intake on reproductive performance of Scottish Blackface ewes and growth of their lambs 383

BETTERIDGE, K. and ANDREWES, W. G. K. A device for measuring and sampling urine output from free-grazing steers 389

BETTERIDGE, K., ANDREWES, W. G. K. and SEDCOLE, J. R. Intake and excretion of nitrogen, potassium and phosphorus by grazing steers 393

BRAR, S. P. S., SINGH, B. and DEOL, Y. S. Zinc pools and their availability to maize–wheat rotation 405

BURSTALL, LINDSAY and HARRIS, P. M. The physiological basis for mixing varieties and seed 'ages' in potato crops 411

POWELL, ALISON, A., OLIVEIRA, M. DE A. and MATTHEWS, S. Seed vigour in cultivars of dwarf French bean (*Phaseolus vulgaris*) in relation to the colour of the testa 419

SHORT NOTES

SMITH, D. B. Variation in the electrophoretic band pattern of tuber proteins from somaclones of potato 427

CHAUHAN, R. P. S. and CHAUHAN, C. P. S. Effect of fluorinated saline water on oats . . 429

PART 3 (JUNE 1986)

SNEDDON, JENNIFER, C. The effect of treadmill slope on the relationship between heart rate and energy expenditure in cattle walking on treadmills 433

REYNOLDS, L. P., FERRELL, C. L., ROBERTSON, DEBRA A. and FORD, S. P. Metabolism of the gravid uterus, foetus and utero-placenta at several stages of gestation in cows . . 437

PAGE

GERSON, T., JOHN, A. and KING, A. S. D. Effects of feeding ryegrass of varying maturity on the metabolism and composition of lipids in the rumen of sheep 445

BUCKERIDGE, D. J. and NORRINGTON-DAVIES, J. Competition for phosphate between establishing plants of *Lolium perenne* and *Trifolium repens* under differing cultivation treatments in an upland pasture 449

SALTER, P. J., AKEHURST, JAYNE M. and MORRIS, G. E. L. Interactive effects of agronomic variables on marketable yield of leeks 455

WILMAN, D. and WRIGHT, P. T. The effect of interval between harvests and nitrogen application on the concentration of nitrate-nitrogen in the total herbage, green leaf and 'stem' of grasses 467

ECONOMIDES, S. Comparative studies of sheep and goats: milk yield and composition and growth rate of lambs and kids 477

DE SILVA, H. N. and OMRAN, A. Diallel analysis of yield and yield components of winged bean (*Psophocarpus tetragonolobus* (L.) D.C.) 485

TRIPATHI, I. D., SINGH, M. and CHANDRA, S. Genotype × macro- and micro-environment interactions in barley populations (*Hordeum vulgare* L.) 491

DARBY, R. J., WIDDOWSON, F. V., BIRD, E. and HEWITT, M. V. The relationship of soil mineral NO_3-N with stem NO_3-N concentration, and of fertilizer-N with the amount of nitrogen taken up by winter wheat, in experiments testing nitrogen fertilizer in combination with aphicide and fungicides, from 1980 to 1982 497

ADAMS, S. N. The interaction between liming and forms of nitrogen fertilizer on established grassland 509

RODGERS, G. A., PENNY, A. and HEWITT, M. V. A comparison of the effects of prilled urea, used alone or with a nitrification or urease inhibitor, with those of 'Nitro-Chalk' on winter oil-seed rape 515

TOWNER, G. D. The influence of particle size distribution on soil physical properties . . 527

PENNY, A., WIDDOWSON, F. V. and JENKYN, J. F. Results from experiments on winter barley measuring the effects of amount and timing of nitrogen and some other factors on the yield and nitrogen content of the grain 537

WIDDOWSON, F. V., DARBY, R. J., DEWAR, A. M., JENKYN, J. F., KERRY, B. R., LAWLOR, D. W., PLUMB, R. T., ROSS, G. J. S., SCOTT, G. C., TODD, A. D. and WOOD, D. W. The effects of sowing date and other factors on growth, yield and nitrogen uptake, and on the incidence of pests and diseases, of winter barley at Rothamsted from 1981 to 1983 551

BROSH, A., CHOSHNIAK, I., TADMOR, A. and SHKOLNIK, A. Infrequent drinking, digestive efficiency and particle size of digesta in black Bedouin goats 575

ARRIAGA-JORDAN, C. M. and HOLMES, W. The effect of cereal concentrate supplementation on the digestibility of herbage-based diets for lactating dairy cows 581

TELLER, E. and GODEAU, J.-M. Evaluation of the nutritive value of single-cell protein (Pruteen) for lactating dairy cows 593

BULLER, K. J. and ENSER, M. The effect of food intake and dietary fatty acids on the activity of stearoyl-CoAΔ^9 desaturase in pig adipose tissue 601

BUCHANAN-SMITH, J. G. and PHILLIP, L. E. Food intake in sheep following intraruminal infusion of extracts from lucerne silage with particular reference to organic acids and products of protein degradation 611

SHORT NOTES

ELLIS, R. P., POWELL, W., SWANSTON, J. S. and THOMAS, C. E. Genetical analysis of a barley mutant with reduced height and increased diastatic power 619

PAGE

KITAMURA, Y. The comparative yields of two types of leucaena (Peruvian *v.* Hawaiian) grown for forage production in Ryukyu Islands 623

GREEN, C. F., IVINS, J. D., HUNTER, B. and MCDONALD, H. G. Applying chlormequat to *Triticum durum*: response of the crop in the absence of lodging 625

GROF, B. Selection of the components of a synthetic variety of *Andropogon gayanus* . . 629

ROOKE, J. A., OVEREND, M. A. and ARMSTRONG, D. G. The effects upon rumen microbial protein synthesis of giving sheep diets of rolled barley and hay supplemented with increasing quantities of soya-bean meal 635